3.

ESSAY

ON

INFLAMMATION.

BY

JOHN HODGSON,

CARLISLE.

TO WHICH WAS ADJUDGED

The First Prize

FOR ESSAYS WRITTEN BY THE GENTLEMEN ATTENDING

MR SYME'S SURGICAL LECTURES,

DURING THE SESSION 1828-29.

In nullâ re, propius ad Deos attinent homines, quam in salutem hominibus dando.—CICERO.

EDINBURGH:

PRINTED FOR MACLACHLAN & STEWART, AND JOHN CARFRAE & SON.

1829.

I HAVE printed this Essay with Mr HODGSON'S permission, because his fellow-students wished me to do so, and because I thought it deserving of the honour.

Mr HODGSON informs me, that it was written hastily, during the distraction of his professional study. He might probably have been able to improve it, by the revision and correction of subsequent leisure and reflection ; but I requested him to let it appear precisely as it was given to me.

J. S.

ON

INFLAMMATION.

Inflammation, from the frequency of its occurrence, the numerous forms under which it appears, and the various textures and organs of body which it is liable to affect, deserves and demands from the medical practitioner, whether Chirurgeon or Physician, the most careful investigation, with respect to its nature, its causes and its treatment. Notwithstanding so much labour and ingenuity have been devoted to this inquiry, we have never yet acquired, (though medicine, as well as every other science, has now attained an hitherto unknown degree of perfection,) any correct or accurate ideas of the nature of this process, which occurs so frequently in the animal economy, which daily obtrudes itself upon the

observation of the medical practitioner, and which, therefore, so nearly concerns the welfare of mankind. No question, since the revival of literature, has given rise to a greater diversity of opinions, than the nature of inflammation, It has been the subject of frequent, and sometimes acrimonious controversies between the most learned and eminent in our profession ; and no part of surgical study is more important, and at the same time more difficult and perplexing. It is with diffidence, then, that I have undertaken to write the following Essay, and rather with a view of rendering my knowledge more correct and perfect, than from a sanguine expectation of attaining the high distinction for which it is a candidate.

The symptoms of inflammation, or those appearances in any part or texture of the body, by which we judge of the existence of this affection, are redness, heat, pain, and swelling.

Since the time of the celebrated Roman Physician, all succeeding authors have enumerated these appearances as the essential characteristics of the disease. They have been supposed so constant and uniform, that Physicians would sooner believe the laws of nature to be changed, than admit the existence of inflammation, without these concomitant circumstances. As the explanation of these symptoms has, therefore, been particularly attended to, it may not be improper briefly to discuss the mode of reasoning usually adopted.

Blood being the only substance in the composition of the human body of a red colour, the redness must be owing to an increased afflux of that fluid to the affected part; hence we find those capillary vessels, which in their natural state carry red blood, distended, admitting a greater proportion of the circulating mass, and those which conveyed colourless fluids, also enlarged, and injected with red blood. Some have supposed that there is an actual generation of new vessels, and in that number, I believe, may be ranked the immortal HUNTER; but this supposition must appear extremely improbable, when we observe the phenomenon produced instantaneously by any mechanical or chemical stimulus, as friction, or the application of the actual cautery.

Physicians have been foiled in their endeavours to account for the increased temperature of inflamed parts. After the discovery of the circulation, the mechanical sect of Philosophers, observing that an increased determination of blood to an organ was always attended with an increase of animal heat, attributed this occurrence to the greater attrition of the circulated fluid against the sides of the circulating vessels. But this superficial and mechanical view of the subject was not sufficient to satisfy the inquiring minds of succeeding Physiologists, and the ingenious theory of animal heat proposed by Dr CRAWFORD was employed in forming a more scientific explanation. This celebrated theory, from the careful and repeated experiments on which it was founded, from the

candour and intellectual abilities of its author, and from its admirable explanation of all the phenomena, was wonderfully calculated to produce a dazzling effect on the minds of scientific inquirers. Accordingly, when first promulgated, it was considered by almost all Physiologists as the most beautiful specimen of chemical reasoning, in accounting for the mysterious operations of the animal economy, that had ever been presented to the world. Blood, according to this theory, having the power of evolving caloric, Physicians readily imagined, that an increased flow of that fluid into the texture of an organ would have the necessary effect of increasing its temperature. Though I am not disposed to acquiesce in the sweeping opinion which many have adopted, namely, that the experiments of Mr Brodie have completely subverted this beautiful and interesting theory, yet, I must confess, that it is entirely unable to explain the heat of an inflamed part. According to this hypothesis, the evolution of heat is accomplished by the change of the blood from the arterial into the venous state; but in an inflamed organ, its functions and nutrition, from the performance of which the blood undergoes the accustomed change, are suspended, and this fluid, therefore, is observed to return as it went, not venous, but arterial; consequently, having its capacity for caloric undiminished, it must still retain its usual quantity. The cause of this symptom has never been satisfactorily ascertained: it may probably be owing to some unusual condition of the

nervous energy; but whatever be its explanation, it is pretty constant and uniform in its appearance, though, when measured by the thermometer, as was shown by Mr HUNTER, by no means commensurate with the feelings of the patient.

The pain in inflammation has been variously accounted for: It has been attributed to the sudden pressure of the nerves from swelling and distension; also to an increase of sensibility produced by the increased vitality said to belong to an inflamed part, which now is painfully affected by impressions before natural and grateful. Pain, however, is not a necessary attendant on swelling and distension, and increased sensibility merely does not satisfactorily account for the different kinds of pain experienced in different varieties of this affection, or in the different textures of the body subject to its influence. It may probably be owing in part to the nerves participating in the general derangement, and in part also to the greater quantity of arterial blood circulating in the diseased organ; for the pain is generally increased by each contraction of the left ventricle of the heart, and when, from any cause, the blood circulating in the body is chiefly venous, there is little or no sensibility to pain.

The swelling can be explained in a more satisfactory manner. It is dependent partly upon the unnatural distension of the blood-vessels, partly upon the effusion of lymph and serum into the cells of the surrounding cellular membrane, and partly also up-

on the interrupted actions of the absorbents, which was particularly insisted upon by the celebrated SOEMMERING.

Notwithstanding these symptoms have always held so prominent a place in treatises upon this affection, we are not to suppose that they are always constant and uniform in their appearance. In external phlegmonous inflammation, they are certainly almost invariably present; but it is a well-known fact, that the most deadly inflammations of internal organs may go on without any of these symptoms being manifested. Heat and pain alone are not necessarily accompanied by inflammatory action, and we have no means of ascertaining whether or not an internal organ be affected with redness and swelling. It is evident, then, that these four symptoms, to which so much importance has been attached, are frequently of very little service in the detection of internal disease. But every organ of the body, when labouring under inflammation, if subjected to a rigid scrutiny, will be found to have its natural actions more or less altered; and singular though it may appear, the attention of the profession has but lately been properly directed to this most constant and characteristic, though probably not most obvious, symptom, namely, "alteration of natural action." This alteration being an invariable effect of inflammation, has very justly been made the groundwork of the following beautiful and accurate definition: "Inflammation "is a morbid condition of the nutrient system, in

"which natural actions are changed or suspended, "and new ones established, effecting an alteration or "destruction of parts."

If local inflammation be extensive, or violent, or continue for any length of time, it is generally attended, preceded, or followed by a sympathetic affection of the system at large, differing in kind and degree of severity, according to the nature, seat or extent of the local disorder. The actions of the heart and arteries become increased; the secretions of the skin, intestinal canal, and almost every other organ of the body become deranged or suspended: hence we have a quick and hard pulse, great heat of surface, foul tongue, thirst, costiveness, chills alternated with flushings of heat, and all those various symptoms denoting the presence of inflammatory fever. In this state of the system, we find the blood, when drawn in a full stream from the veins of the patient, and received into smooth and polished vessels, to exhibit a peculiar appearance on the surface of its coagulum, which has been well described by the late Dr Parry of Bath, and has been named the buffy or inflammatory coat. Considerable importance has been given by authors to this appearance of the blood, as affording us no little assistance in forming our diagnosis, and directing our treatment in many cases of disease. But as it is liable to be modified by various extrinsic circumstances, it is necessary to be acquainted with these, before allowing its absence or presence to have that weight in our

reasoning, that has been claimed for it by practical writers.

This phenomenon has been ascribed by Mr Hunter to the blood having a disposition to coagulate more slowly in that state of the system, by which its different component parts are allowed time to separate according to their specific gravities; hence the red globules subsiding leave at the top the coagulable lymph, upon which the appearance depends. Others have supposed it owing to a predominance of the latter ingredient, caused by the suspension of nutrition, and other secretions consequent on this disease. At all events, any circumstance which has the effect of hastening the coagulation prevents the formation of the buffy coat. Therefore, if the blood be taken away in a slow or interrupted stream, if it be received into a hot vessel, or if it be stirred for a time, or much disturbed during its coagulation, the fibrinous coat will not be apparent, or at least less evident, than when drawn under opposite circumstances. The different periods of the evacuation have also considerable effect upon the manifestation of the buffy coat. Dr Thomson informs us, that if the blood be received into three separate cups, in general the buffy coat will not be observed in the first cup, that it will appear in the second, and be more abundant in the third. This has been attributed to the patient, during the early part of the operation, being under the influence of fear, but gradually regaining his confidence, so as to allow the blood to flow in a fuller and more project-

ing stream. I have always observed an exactly contrary effect to take place in blood drawn under the preceding circumstances, namely, that the fibrinous coat was most abundant in the first cup, less in the second, and little, if at all, evident in the third.

It is not only in cases of inflammation that this singular appearance is produced, for it has been also observed in other conditions of the body, as pregnancy, and several states of excitement, the result of irritation or mental emotion. The coagulum of blood also is possessed of a firmer texture than usual, indicating a stronger degree of contraction, from which is frequently produced an inversion of the edges, giving us the cupped appearance of authors. This firmness of texture is probably a more faithful indication, than the mere presence of the buffy coat, of the strong and excited action of the heart and arteries.

We come now to this much contested point, the nature of inflammation. Concerning this part of our subject, the notions of the older Physicians, before the discovery of the circulation of the blood, were necessarily vague and erroneous. After that important æra in medicine, the first hypothesis deserving of notice was made by the illustrious Boerhaave, who ascribed the phenomena of inflammation to an obstruction of the circulation in the part affected. This obstruction, he conceived, was occasioned either by a preternatural lentor or viscidity of the blood, or by its larger globules, (for this fluid was supposed to consist of larger and smaller globules,) entering into

vessels intended for the smaller, plugging them up, and impeding the circulation.

The spasmodic doctrine, which was founded upon the ruins of that of Boerhaave, still preserved the principle of obstruction, but substituted for the lentor and *error loci* of the blood a spasm of the extreme vessels, which, according to Cullen, being produced by an effort of the "vis medicatrix naturæ" to relieve herself from an inequality in the distribution of the blood, resulting from the causes of inflammation, effectually obstructed the circulation through the part so affected, and satisfactorily accounted for all the phenomena. This doctrine is equally as absurd, and probably more unintelligible than the former, and, but for the reputation of its founder, certainly could never have been allowed to supersede it. Nor does Cullen appear to have the merit even of being its original proposer; for we are told by his strenuous adversary, Dr Brown, that "it was first suggested by Van Helmont, and "clumsily wrought into a system by Hoffman, was "banished by Boerhaave from the country that "gave it birth, and at last found a friend and protector in Dr Cullen." Mr Hunter, who paid great attention to this subject, does not appear to have been more happy or fortunate in his views, a circumstance strongly calculated to damp the ardour of succeeding inquirers. He conceived inflammation to consist in an increased action of vessels; but that this increased action did not effect, as might natu-

rally be supposed, a diminution of their area, but was an effort to distend them beyond their natural size, which effort he called an act of dilatation.

The hypothesis which appears to have enjoyed the most long lived celebrity, is that which attributes inflammation to a morbidly increased action of the capillary vessels. This doctrine, according to Dr Wilson Philip, was an inference from the mistaken notions that prevailed respecting the cause of animal temperature: according to Dr Thomson, it was suggested by the views which Stahl took of the animal economy, attributing a tonic, vital, or muscular action to the arteries. After it had been more fully explained and enforced with various arguments by Stahl's disciples and followers, particularly Dr Gorter, it was adopted by the bulk of the profession, and at this day is possessed of several advocates and adherents.

A theory, directly the reverse of this, was first regularly submitted to the attention of the profession, about the year 1790, by Dr Lubbock of Norwich, and Mr Allen of Edinburgh, though, as Dr Thomson tells us, it had been stated several years before by an Italian Physician, Vacca. According to this view, inflammation was explained by supposing that the balance of actions between the capillary and larger arteries, which is necessary for the proper performance of their functions, being destroyed, the capillary vessels are thrown into a state of debility, and the larger into that of increased action.

This doctrine has been vigorously supported, with much learning and ability, by Drs Wilson Philip and Hastings, who made several microscopical observations on the web of the frog's foot, in which inflammation had been produced for that purpose. These observations, they inform us, prove the increased area, diminished action, and slower circulation of the capillary vessels. Dr Thomson also performed similar experiments, and found that the circulation was sometimes increased and sometimes diminished in an inflamed part, and therefore concluded that neither of these circumstances ought to enter into the definition of inflammation.

The late Dr Parry, in his very excellent work on "Pathology and Therapeutics," attributes the phenomena of inflammation to a simple increased momentum of blood, differing apparently from the last-mentioned doctrine with regard to the velocity of the circulation in the part concerned, which he affirms to be the same as in the healthy state. Not allowing any propulsive muscular power to the capillaries in the general circulation, he argues that, though the momentum of blood in any particular part be increased, nevertheless, owing its motion to one impulse, its velocity must still remain the same. Now, he supposes the predisposition to local inflammation to be a proneness to dilatation in the capillary vessels; which proneness to dilatation, he says, is owing either to a general increased impetus of the circulating mass, or to a defect of tonicity, or vital

contractility in the vessels themselves. He further says, that, for the cure of inflammation, these vessels have an inherent power of resuming their natural state of contraction, by which, if not too long or over distended, they are enabled to expel the misplaced or superfluous blood. From these and other similar observations to be found in his work, I think it is fair to infer, that he differs in *appearance only* from the theory of debility.

It would be endless to enumerate all the different theories and opinions that have from time to time been brought forward. Almost every Physiologist who has written upon this subject has had something peculiar in his views,—some modification or another of one or all of the various doctrines that have severally prevailed. In taking into consideration these respective doctrines, and all the arguments and experiments on which they have been founded or supported, I think the following conclusions may safely be drawn: *First*, That the combination of symptoms, to which the term inflammation is given, is the result of some unnatural, diseased condition, however produced, of the minute capillary vessels. *Secondly*, That the natural state, function, and action of these vessels, from the knowledge of which all correct pathological data must spring, are by no means known or understood: And, *thirdly*, That this important part of the circulatory system has not sufficiently attracted the attention of Physicians, in the investigation of this intricate question.

The splendid discovery of Harvey, which formed so important an æra in medical, nay, in human science, must still be considered as incomplete and imperfect, until some fortunate inquirer shall have the merit of tracing out, and showing to the world, the causes of the circulation in the innumerable and wonderful ramifications of the circulatory organs. The most superficial observer cannot but be struck with the paramount importance of the capillary system, and comparative insignificance of the larger vessels, in the various operations, healthy or diseased, going on in the animal economy. We find them ramified to an inconceivable minuteness throughout the delicate and intimate texture of our organs, most numerous and intricate in those which have most numerous and important functions to perform. The labours of the Anatomist have shown them to be so intimately mixed up with the structure of various parts of the body, as to induce some to suppose their ultimate organization to consist entirely of blood-vessels.

Knowing these circumstances, then, though there be an excuse for Harvey, and his immediate followers, in ascribing the blood's motion through the entire course of the circulation to one impulse, they being naturally unwilling to allow the beauty and efficiency of the heart's action to be impaired by any extrinsic or collateral aid, it is a matter of surprise, however, that long after, and even in the nineteenth century, such an opinion should have any adherents,

when time has long since effaced the dazzling effect of a new and splendid discovery. Some modern Physiologists, among whom the most conspicuous are Doctors Carson and Barry, wishing to preserve the unity of the heart's action, and aware of the inefficiency of its propelling power, have assigned it another cause of motion, a *vis a fronte.* According to their views, the dilatation of the right cavities of the heart occasions a vacuum, into which the blood must necessarily rush, and this, upon the principle of a suction machine, is a source of considerable power. But it has never been proved that the heart possesses within itself an inherent power of dilatation: indeed, it is probable that its cavities do not dilate, but are distended merely by the impulse of the flowing blood. This mode of reasoning also is too mechanical: it is explaining the phenomena on the principles of hydraulics, which might probably, in some measure, prove satisfactory, if confined to the larger organs of the circulation, but which fall lamentably short when applied to the capillary vessels. The former may, comparatively, be considered as mere mechanical pipes or tubes for the conveyance of blood to other more vital organs: but it is through the immediate medium of the latter that all the vital functions are performed.

Numberless facts and observations daily occurring completely disprove the unity of the heart's action. The act of blushing, the slight erubescence of the skin produced by friction, and the erection of the penis

from the venereal appetite, are the most familiar but not the only proofs of a motive power, independent of that of the central organ of the circulation. This motive power has, by some, been said to be a muscular action of the vessels themselves, by which they act upon the blood, propelling it forwards according to their degree of contraction; but this opinion, I believe, is now generally abandoned.

All our knowledge on this part of physiology is entirely hypothesis, and probably must ever remain so; since in the investigation we can derive no assistance from anatomy, the true test and parent of all physiological science. The ascribing the capillary circulation to the "power of life," is flinching from the subject: it is surmounting the difficulty by a flying leap: it is cutting the "Gordian knot," after the manner of the Grecian warrior, Alexander the Great, —not unravelling its mysterious folds.

I am inclined to believe, that if ever our knowledge of the blood's motion through the capillary vessels be increased, it must be done by fair and rational induction from analogical reasoning, and not by observations and experiments confined to the organs themselves. We have had too many instances of failure by this manner of proceeding, not to be convinced of the futility of any future similar attempt. There are several phenomena, both in the organised and unorganised kingdoms of nature, similar to the capillary circulation in the animal body. The ascent of the sap in plants, the motion of the

chyle and lymph in the lacteals and absorbents towards the central organ of the circulation, are both equally inexplicable—equally mysterious.

Various galvanic experiments present phenomena similar to the above-mentioned natural operations. By the actions of galvanism, a substance can be made to move from one vessel to another, which are connected together merely by an animal or vegetable fibre. By galvanism also, as has been more lately shown by the experiments of Reuss and Dutrochet, water can be made to pass through water-tight clay; —a circumstance more wonderful even than the capillary circulation, the ascent of the sap in plants, or the motion of the chyle or lymph in the lacteals and absorbents.

A curious phenomenon is likewise sometimes observed by mariners, namely, the ascent of water in a full and continued stream from the surface of the ocean into the higher regions of the atmosphere, forming that singular appearance denominated a water-spout. This is owing also to the agency of galvanism; for the clouds, being in a state of negative electricity, have a powerful attraction for the water, which is in a state of positive electricity. The actions of galvanism, which are so miraculous on inert and inorganic matter, might, if properly investigated, probably afford some clue towards the explanation of the yet unexplained functions of organised beings. The following curious remark in the Encyclopædia Britannica, article *Hydrodynamics*, seems strongly

to favour such a supposition : "When water is made "to pass through a capillary tube of such a bore "that the fluid is discharged only in successive "drops, the tube when electrified will furnish a con-"stant and accelerated stream, and the acceleration "is proportioned to the smallness of the bore."

Certain species of animals possess within their own bodies a wonderful power of generating electricity, and giving out shocks at will. This circumstance, I think, must be allowed to favour the supposition of a galvanic power over the circulation, when we reflect upon the great light, which has been thrown upon several physiological questions, by the labours of the comparative Anatomist, and when we recollect also, that there are certain great and uniform laws of organization extended throughout the whole system of animated beings, in accordance with which laws we sometimes have an organ in one species of animals rudimentary and apparently useless, in another fully developed and called into action, for the performance of some function, according to the necessities of its possessor.

Some, and more especially Dr PHILIP, have thought galvanism to be identical with the nervous energy of Physiologists ; but in extending its power to the capillary circulation, I should rather conceive it to be a supperadded, and in some degree an independent principle ; since we know, that the circulation, though probably diminished in energy, is still carried on in a paralysed limb ; and the experiments

of Mr Brodie have shown, that the circulation can be considerably prolonged by artificial respiration, after all the nervous energy and life itself have been extinguished. This subject, however, I imagine, is certainly deserving of further and more able investigation. So long as we are ignorant of the natural actions of those organs in which inflammation is situated, so long must we continue ignorant of their actions in that their diseased state. The effects of inflammation we are well acquainted with,—its causes we have ascertained; but its nature has as yet eluded our research.

In taking leave of this part of my Essay, I shall next proceed to speak of something more tangible,—the effects of inflammation, endeavouring to trace it from its first origin or commencement to its several terminations. When an exciting cause of this affection has been effectually applied to any part of the animal body, the whole natural actions of that part undergo considerable alteration: its secretions, and whatever other functions it was performing, are suspended or deranged; its circulation is altered, and its own nutrition also is affected. This condition in general is attended by the four symptoms described by Celsus, " rubor et tumor, cum dolore et " calore." If the exciting cause has not been severe, and the succeeding inflammation moderate, or if the proper curative means have been promptly and decisively resorted to, these symptoms gradually subside, and the organ resumes, by degrees, its natural

functions, without undergoing any alteration in its structure. This is resolution, its most desirable and favourable termination. Should the inflammation be more excessive, it frequently terminates, according to the nature of the affected organ, or the degree of inflammatory action, either in an effusion of serum, constituting that state of the body called dropsy, or in an effusion of coagulable lymph, which, in some cases, as iritis and croup, is productive of the most serious consequences; in others, again, is not only a source of no inconvenience, but often affords us one of the most beautiful illustrations of the resources of Nature, in resisting and accommodating herself to the various accidents and "ills which flesh is heir "to." It is through the medium of this latter effusion, that a third termination of this process obtains —adhesion. Another termination, and one which is frequently desired by the Surgeon, is absorption: this is frequently an effort of Nature to relieve herself from any foreign and irritating body; by it, sloughing, or the removal of mortified parts, is accomplished, and by it also the process of ulceration is affected. When inflammation has overstepped the bounds of resolution, the chief object of the Surgeon is to procure suppuration, which is merely a separation or secretion from the blood of a peculiar fluid, called pus, produced by the altered action of the capillaries, into the substance of the part inflamed, forming what in common language is called an abscess. Sometimes we have another effect, which

eminently shows the derangement of nutritious action in the vessels concerned, namely, the formation of morbid growths. This termination has very properly been called diseased nutrition.

When inflammation has been excessive, or has supervened either on a part possessing weak powers of action, or on a debilitated and unhealthy constitution, instead of resolving itself into any of the preceding salutary actions, we occasionally find it to continue with increased intensity, until the capillary vessels, exhausted of their vital energy, are not only rendered incapable of any restorative process, but are also no longer able to carry on either healthy or diseased action. This state is characterized by an abatement of pain, which is sometimes sudden; the colour of the part changes from a florid red to a livid hue; the cuticle becomes detached from the skin at several points, forming vesications, which are termed phlyctænæ. The constitution, before labouring under the great excitement of inflammatory fever, is now quickly thrown into a state similar to that of the lowest typhus. Instead of the furred tongue, the hot skin, and the general increased arterial action, we have a weak, fluttering, and intermittent pulse, coldness of the extremities, clammy sweats, and great relaxation of the muscles, giving us that sure harbinger of death, the "Facies Hippocratica." This very deplorable, but fortunately rare effect, is denominated mortification. Thus we perceive that this process most frequently terminates

in an alteration of structure of one kind or another; hence it has with justice been said to be "a condi-"tion intermediate between the healthy and de-"structive operations of an organ." Mr HUNTER, (whose opinions upon this, as well as every other subject to which he turned his attention, have deservedly had great influence upon the minds of the profession,) seeing the various efforts of Nature in this affection to restore parts to their pristine perfectness, inculcated, "that inflammation was a disturbed "state of parts, which requires a new but salutary "action to restore them to their natural actions; "and therefore was not to be considered in itself as "a disease, but a salutary operation, consequent on "some violence or disease." He does not appear to have mentioned mortification as one of its terminations; for we find him speaking of it only under the names of adhesive, suppurative, and ulcerative. As Dr THOMSON justly remarks, it is a matter of deep regret, that he has not given us an account of gangrenous inflammation, which his powerful mind would, no doubt, have rendered most instructive and interesting.

This condition of parts, concerning the nature and termination of which we have said so much, is observed to arise from the operation of various causes; the consideration of which, though having priority in the natural order of things, I have, as is usually done, reserved for this part of my Essay. I shall divide the exciting causes of inflammation into direct

and indirect; of which the former may be again subdivided into mechanical and chemical; and the latter form a numerous and important class of causes, embracing within their study one of the most difficult and intricate subjects in all physiology,—the sympathy of organs. Under the head of mechanical causes are ranked pressure, friction, blows or contusions, and the presence of any foreign body in the texture of an organ. All these produce their effects by the irritation consequent on their bulk or other mechanical quality, and are so familiar as to be exemplified in the daily occurrences of life. Under the head of chemical causes are ranked chiefly all those substances, which produce their effects independently of their bulk, manner of application, or any other mechanical property. These are the concentrated acids or alkalies, various metallic and vegetable substances possessing an acrid property, blisters, rubefacients, and certain animal poisons, those of insects and serpents. To these are likewise added extremes of temperature, as heat and cold: the latter holds a prominent place in the second class of causes; and we have also frequent examples of its producing this affection directly; but how its action in that case can be explained on chemical principles, I am at a loss to understand. The immediate effect of cold is to lessen the actions of the part to which it is applied, upon which the system, taking the alarm, as it were, brings up all her forces to the weakened part, and

establishes reaction, which, if excessive, runs on to inflammation.

The indirect causes are those which produce inflammation in parts distant from that on which they immediately operate, and frequently at a considerable interval of time after their application.

In order to understand their *modus operandi*, we must recollect that the human body is composed of an assemblage of organs, each performing a peculiar function, united and associated into one consentient whole. In this complicated machine, no one organ is independent of other organs,—no one function independent of other functions,—all mutually sympathize with one another, and, for the well-being of the animal, must all act in unison and harmony.

Like the well-regulated Ministry of a great nation, although its several officers have different departments to superintend, and consequently different duties to perform, yet, for the advancement and security of the nation's welfare, they must all act consentaneously and harmoniously; the same internal system of policy must alike pervade the movements of each individual minister. So it is with the animal body: when any organ, from whatever cause, becomes faulty in its action, in proportion to the importance of its office, the various other organs become more or less sympathetically affected, according to their proximity or their similarity in texture or in function to the faulty member. Thus we may be enabled, in some measure, to comprehend the

manner in which inflammation is produced, by the operation of the indirect exciting causes. The most conspicuous and familiar examples of these is cold. In this part of the world, especially in the spring and autumn seasons, when the climate is, if possible, still more variable, we have numerous instances of inflammation of internal organs, produced by the application of cold to the feet, or surface of the body in general. The suppression of the cutaneous secretion thus produced, if not timely restored, must be counterbalanced by some equivalent action, and this is generally inflammation. Another important, and frequently acting cause, is a suppression or derangement of the secretions of the intestinal canal : this is most frequently followed by an inflammatory affection of the skin, but is sometimes also productive of much more serious effects. I am inclined to believe, that the spontaneous inflammations of authors, if strictly investigated, would very frequently be found to have their origin from this cause. In this class are likewise enumerated all the morbid animal poisons, which generally produce what are called specific inflammations. These are infectious and contagious : as instances of the former, I may mention syphilis, cow-pox, small-pox, hydrophobia ; of the latter, contagious fevers, the plague, measles, &c. All these causes differ from the other class, in producing their effects through the medium of the general system.

If there be one subject more deserving than another of the particular attention of medical men, it is the treatment of inflammation, whether we consider the frequency of its occurrence, its destructive ravages, or the influence we possess over its progress by the exercise of the healing art. Although the means we are possessed of for subduing this affection, and preventing or moderating its injurious consequences, are both numerous and simple, yet scarcely in any department of medicine is there more room for displaying the nice discernment and practical tact of the surgeon, than in the proper adaptation of these means to the cure of each individual case. To the young practitioner, the word inflammation is frequently a signal for letting loose upon his patient the whole host of remedies with which medicine has furnished him. The older one, on the other hand, having learned, by experience, while endeavouring to avoid the shoals of Scylla, to steer clear of the rocks of Charybdis, like Nature in her operations, is more sparing in his means, and more fruitful in his effects. A knowledge of the causes of this disease is of the utmost importance in directing the proper mode of treatment. The first duty of the practitioner, when called to a patient labouring under inflammation, is to ascertain the cause from which it has arisen. If still in action, it must be removed; and if it has ceased to operate, the knowledge thus acquired will better enable him to restore the disturbed balance of actions. If on the removal

of the cause, which is frequently all that is necessary for the cure of the disease, the symptoms still continue urgent, we are quickly to adopt the most decided antiphlogistic measures. Of these bleeding is the most powerful, and is generally indicated by the presence of symptomatic inflammatory fever.

Although in the hale and robust constitutions of those who lead a country life, and who are frequently subject to inflammations, profuse sanguineous depletion can be borne with safety and advantage ; yet it will be a good rule never to detract more blood than is absolutely necessary for the suppression of the disease. When we consider well the immediate and remote effects of this evacuation, the necessity of this rule must be still more obvious. Bleeding, if very profuse, may be followed by an immediate sinking of all the living powers ; but this, I conceive, will seldom or never happen in the hands of a Surgeon. To the state of collapse, which immediately supervenes on the detraction of blood, reaction succeeds, which, when the evacuation has been considerable, may become excessive, and take on all the symptoms of inflammation ; but from this it must be carefully distinguished, as a second bleeding might be a source of the most serious consequences. A sort of permanent debility, I believe, is sometimes occasioned by profuse venesection, similar to what we generally find resulting from a long-continued drain upon the system. This state is characterised by general emaciation, anasarcous extremities, pale-

ness of the countenance, flaccidity of the muscles, and great nervous irritation. We frequently observe women to be thus affected, who have laboured under profuse, or long-continued menorrhagia. I remember the case of a man, who for a pretty sharp attack of pneumonic inflammation, at one time was bled to the extent of fifty ounces: all inflammatory symptoms were arrested, but he continued an invalid for the space of three months, affected merely with the above-mentioned symptoms.

Notwithstanding this, I am by no means an advocate for the expectant treatment of the French, amusing ourselves and our patient with ptisans, and other harmless and useless remedies.

"Est modus in rebus; sunt certi denique fines,
"Quos ultra citraque, nequit consistere rectum."

HORACE.

Urgent symptoms must be combated; and we should always recollect, that the best way of making an impression on the disease at the least possible expense to our patient, is to detract the necessary quantity of blood with as much rapidity as possible, namely, from a large and free incision into a suitable vein. Bloodletting, while it is one of the most powerful means of subduing inflammatory action, and of all remedies, from its sudden and striking effects, most calculated to secure the confidence of the bystanders in the resources of our art, is, at the same time, in the hands of a rash and inexperienced practitioner, frequently a source of the most dangerous consequences.

When bleeding has been premised, our next object is to restore the secretions of the intestines, and increase their peristaltic action, by the exhibition of purgative medicines. Those of the stronger kind will in general be necessary, especially if they precede bloodletting. Enemata may be used as adjuvants, but must not be trusted to alone for procuring the effect we expect from the employment of purgatives. The actions of another very important organ, the skin, next require our attention. We must restore its secretions by the use of diaphoretics; and probably the most useful of this class are the preparations of antimony. These, at the same time, produce considerable nausea, which has a tendency to lessen the powers of the system, without occasioning any real debility. The warm bath, semicupium, and pediluvium, will also be found important auxiliaries. To make up the complement of the antiphlogistic plan, it may be necessary to add, that a total abstinence from all animal and irritating food, and a strict observance of quietude both of body and mind, will conduce much towards the recovery of our patient. These are the powerful constitutional means of subduing inflammation, and in the generality of cases will be found admissible and highly effectual. In their employment, however, we must always bear in mind, that constitutional remedies are only to be resorted to when constitutional symptoms are manifested. In weak irritable constitutions, we must be very cautious in the employment of evacuants: in such

cases, it will be advisable to trust more to nauseating remedies, which are known to have a powerful effect in subduing inflammation. In what are called specific inflammations, we will frequently find evacuations to be not only useless, but extremely injurious. In gout also, after it has become habitual, no one would think of employing bleeding, purgation, or profuse sweating : these means would have no effect in arresting the progress of the disease, and they would induce a dangerous degree of debility. In this case, we must have recourse to anodyne medicines, as opium or henbane, to allay the constitutional irritability, and benumb the feelings of the patient during the continuance of the paroxysm, at the same time correcting the disordered actions of the skin and intestinal canal ; for nothing is so conducive to the preservation of health, or its restoration in disease, as the proper actions of these two continuous organs.

The local means of arresting inflammation are deserving of our careful study : if timely and properly adopted, they frequently prevent the necessity of resorting to more violent constitutional measures. The detraction of blood by leeches or cupping from the neighbourhood of the part inflamed, is a very effectual means of allaying inflammatory action. Whether this remedy act by derivation or revulsion, or by whatever other term the learned may please to denominate its *modus operandi,* it is sufficient for us to know that it has a very satisfactory effect in alleviating all the symptoms, as well constitutional as local, espe-

cially in cases of acute inflammation. Cold applications have very frequently an agreeable and beneficial effect in reducing the temperature, diminishing the pain, and promoting the resolution of inflamed parts: this remedy is most efficacious when applied to recent burns.

Acetite of lead, particularly when conjoined in solution with opium, is extremely useful in allaying the morbid irritability of parts labouring under this action. It is eminently serviceable when applied to inflamed veins, absorbent vessels, and glands.

Other substances, as solutions of sulphate of zinc, muriate of ammonia conjoined with vinegar or alcohol, have been occasionally used under the name of discutients: they are supposed to act beneficially by increasing the actions of the absorbents.

Warmth, as well as its antagonist cold, is proved by experience to be frequently a very useful local application. Although in some inflammations, cold applications are certainly preferable, generally speaking warmth is a more grateful and beneficial remedy. Its use is always more satisfactory in hernia humoralis and inflammations of the joints; but in making our choice between these two opposite remedies in the other cases of inflammation, I conceive we must be guided chiefly by the feelings of the patient. If inflammation have arisen from weakness, be of a chronic nature, or dependent on defective powers of action, then, instead of the preceding means of diminishing action, we must employ re-

medies of an opposite nature, namely, stimulating embrocations, as warm spirits, camphorated oil, &c.

Upon a knowledge of the laws of sympathetic action is founded an important part of practice,—counter-irritation. By this we endeavour to remove one disease by the substitution of another, less dangerous and annoying of course, than the one already existing. For this purpose we employ blisters, rubefacients, issues, setons, and the potential or actual cautery. The use of blisters, or rubefacients, which are a lesser degree of the same remedy, before the constitutional symptoms have been partly abated by previous venesection, is somewhat doubtful. The irritation they produce is liable to increase the already excited irritability of the patient, without materially affecting the progress of the local disorder. But when this evacuation has been premised, blisters are in general very beneficial. We often have occasion to observe the cure of an inflamed internal organ, begun by venesection, satisfactorily completed by the application of a blister. In chronic inflammations, where bleeding is inadmissible, blisters are frequently useful, and it is in these also that issues and setons are chiefly serviceable.

When the disease is of a specific nature, or is caused by some morbid condition of the system, for the removal of which it appears to be a necessary action, which is doubtless the case in gout, few or none of the means I have mentioned can with safety be resorted to. In such cases, we must remember, that

the best manner of proceeding is not to attempt arresting the progress of the affection, but to palliate distressing symptoms, and endeavour to conduct our patient with safety through the progress of the disease to its natural termination.

THE END.